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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/955,470	09/18/2001	Andreas Blumhofer	SCHWP0147US	7741
7590 05/10/2004			EXAMINER	
RENNER, OTTO, BOISSELLE & SKLAR, LLP			SONG, HOON K	
Nineteenth Floor			ART UNIT	
1621 Euclid Avenue			PAPER NUMBER	
Cleveland, OH 44115-2191			2882	

DATE MAILED: 05/10/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

09/955,470

Applicant(s)

BLUMHOFFER ET AL.

Examiner

Hoon Song

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 28 November 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-26 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) 25 and 26 is/are allowed.
- 6) ☒ Claim(s) 1, 4-13, 15-22 and 24 is/are rejected.
- 7) ☒ Claim(s) 2, 3, 14 and 23 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 18 September 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date: \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## **DETAILED ACTION**

### ***Claim Objections***

Claims 1-2 and 18 are objected to because of the following informalities:

In claim 1, line 6, "the radiation target" lacks proper antecedent basis. On line 8, "the x-ray image" lacks proper antecedent basis and spelling error "localised". On line 14, "the positioning error" lacks proper antecedent basis.

In claim 2 on line 4, "the radiation range" lacks proper antecedent basis.

In claim 18, on line 2, "may be moved" is vague.

Similar informalities exist throughout the claims. Appropriate revision/correction of all claims is required.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 11, 13, 21-22 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Murphy et al. (US 6125164) in view of Watanabe (US 6113264).

Regarding claims 1 and 21, Murphy teaches a method for accurately positioning a patient for radiotherapy and/or radiosurgery, comprising the following steps:

- a) the patient is pre-positioned as accurately as possible with respect to a linear accelerator;

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- b) after the patient has been pre-positioned at least two x-ray images of the patient and/or one of the parts of his body in the vicinity of the radiation target point are produced from different respective recording angles on an image recorder (column 5 line 1+);
- c) the x-ray image is spatially localized (column 5 line 5+);
- d) at least one reconstructed image, corresponding to each x-ray image and deriving from a three-dimensional patient scan data set, is produced, the reconstructed images giving the desired image content of the respective x-ray image when the patient is correctly positioned (column 4 line 25+ and column 5 line 15+);
- e) the reconstructed images and the x-ray images are superimposed, and the positioning error is determined electronically (column 5 line 20+).
- f) the position of the patient is corrected by way of the determined positioning error (column 6 line 1-14).

However, Murphy fails to teach that the different respective imagines are produced from a single image recorder.

Watanabe teaches an x-ray source and detector rotating type system having a single detector to take image at different respective points.

It would have been obvious to one of ordinary skill in the art at the time of the invention to provide x-ray system of Murphy with the x-ray system as taught by Watanabe, since the x-ray system of Watanabe would provide more angular positions for better target localizing.

Regarding claim 11, Murphy teaches that the reconstructed image/s is/are produced as:

- Digitally Reconstructed Radiographs (DRRs);
- Digitally Composited Radiographs (DCRs);
- MIP images,

or as any two-dimensional image reconstruction from a three-dimensional patient scan data set (column 4 line 36+).

Regarding claim 13, Murphy fails to teach that the position of the patient is corrected by manually guiding the table.

It would have been obvious to one of ordinary skill in the art at the time of the invention to manually position the imaging system of Murphy since manual positioning of the table would allow the operator to <sup>make</sup> small adjustments.

Regarding claim 21, Murphy teaches a method for accurately positioning a patient for radiotherapy and/or radiosurgery, comprising the steps of:

pre-positioning the patient with respect to a linear accelerator;

after pre-positioning of the patient, producing at least two x-ray images of at least a portion of the patient in the vicinity of a radiation target point at different respective recording angles (column 5 line 1+);

spatially localizing the x-ray images to obtain respective localized x-ray images (column 5 line 5+);

reconstructing from a three-dimensional patient scan data set reconstructed images respectively corresponding to the localized x-ray images (column 5 line 12+); and

using the reconstructed images and the respective localized x-ray images to determine a positional error between the radiation target point in the reconstructed images and the radiation target point in the localized x-ray images (column 5 line 20+).

However, Murphy fails to teach that the different respective images are produced from a single image recorder.

Watanabe teaches an x-ray system having a single detector to take the image at different respective points (locations).

It would have been obvious to one of ordinary skill in the art at the time of the invention to provide x-ray system of Murphy with the single detector system as taught by Watanabe, since the x-ray system of Watanabe would provide more angular positions for better target localizing.

Regarding claim 22, Murphy teaches that adjusting the relative positions of the patient and linear accelerator to compensate for the positional error (column 5 line 37+).

Regarding claim 24, Murphy fails to teach the positional error is determined by superimposing the x-ray images and the reconstructed images using image fusion. Instead Murphy teaches a mathematical superimposing between the x-ray images and the tomographic image.

It would have been obvious to an artisan of ordinary skill in the art at the time the invention was made to superimpose the x-ray image and the reconstructed image using

known image fusion because it would allow the surgical person to visually see the superimposing process so that it would give more reliability of the surgical operation.

Claims 5-10, 12, 15-16 and 19-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Murphy as modified by Watanabe as applied to claim 1 above, and further in view of Sturm (US 5315630).

Regarding claim 15, Murphy teaches a device for accurately positioning a patient for radiotherapy and/or radiosurgery, comprising:

- a) at least two x-ray sources (36, figure 3, column 5 line 2+) with which x-ray images of the patient (P) and/or one of the parts of his body in the vicinity of the radiation target point (tumor) may be produced from respectively different recording angles;
- b) a means (42) by which the x-ray image may be spatially localized;
- c) a means (44) by which at least one reconstructed image, corresponding to each x-ray image and deriving from a three-dimensional patient scan data set, may be produced (column 5 line 12+); and
- e) a means by which the position of the patient is corrected with respect to a linear accelerator (1) by way of the determined positioning error (column 5 line 33+).

However, Murphy fails to teach that the system comprises only one image recorder and fails to teach that the reconstructed images and the x-ray images are superimposed using landmarks. Instead Murphy teaches that detecting the position error by comparing the two feature vectors using a mathematical equation (column 5 line 1-41).

Watanabe teaches an x-ray system with an x-ray source and detector rotating type system having a single detector to take image at different respective points.

It would have been obvious to one of ordinary skill in the art at the time of the invention to provide x-ray system of Murphy with the x-ray system as taught by Watanabe, since the x-ray system of Watanabe would provide more angular positions for better target localizing.

Sturm teaches a method of superimposing using landmarks.

It would have been obvious to one of ordinary skill in the art at the time of the invention to provide the method positioning of Murphy with the landmarks superimposing as taught by Sturm, since Murphy's method of superimposing by mathematical equation is functionally equivalent to superimposing of Sturm. Accordingly, it would have been obvious to one of ordinary skill in the art at the time the invention was made to employ Sturm's landmarks superimposing because it would allow the surgical person to visually see the superimposing process so that it would give more reliability of the surgical operation.

Regarding claim 16, Murphy teaches that the image recorder is an image intensifier or detector (42).

Regarding claim 19, Murphy teaches that the two x-ray sources (42) are arranged respectively over a patient table and to the side (figure 3).

Regarding claim 20, Murphy teaches that the two x-ray sources (42) are arranged respectively beneath a patient table (4), and to the side, the image recorder



being positioned above the patient table (figure 3, when the patient table is positioned for imaging).

Regarding claim 5, Murphy as modified by Sturm teaches that the patient is pre-positioned by means of a navigation and tracking with computer and camera guidance, with the aid of artificial arrangements of markers on the patient and on the device for treatment (abstract).

Regarding claim 6, Sturm teaches that the patient is pre-positioned using markings on the patient's skin, natural landmarks or laser marking (abstract).

Regarding claim 7, Murphy teaches that the x-ray images and the reconstructed images are superimposed by way of natural structures (feature vector) present in the x-ray images and the reconstructed image.

Regarding claim 8, Sturm teaches that the images and the reconstructed images are superimposed by way of artificial structures (marks attached) present in the x-ray images and the reconstructed images.

Regarding claim 9, Sturm teaches that the x-ray images and the reconstructed images are superimposed by marking them manually and sliding them over one another on a computer display unit (figure 9).

Regarding claim 10, Murphy teaches that the x-ray images and the reconstructed images are superimposed by automatic computer guided image fusion (column 5 line 21+).

Regarding claim 12, Murphy teaches that the position of the patient is altered by shifting the patient table using marks on at least one of the patient and patient table (column 5 line 37).

***Allowable Subject Matter***

Claims 25 and 26 are allowed over prior art.

Claims 2-4, 14 17-18 and 23 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter:

Regarding claim 2, none of the prior art fails to teach that the x-ray images are produced in defined positions offset with respect to the location at which the patient is pre-positioned and, outside of the radiation range of the linear accelerator, the reconstructed images being produced with the same offset as claimed in dependent claim 2.

Regarding claims 4 and 17, none of the prior art fails to teach that the x-ray images are produced at an oblique angle on the single image recorder spatially arranged horizontally, and projected back onto each respectively defined normal plane, the corresponding reconstructed images being likewise produced in these normal planes as claimed in dependent claim 4.

Regarding claim 14, none of the prior art teaches or suggests that a multitude of images over a breathing cycle are produced from each angle, each time x-ray image

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are produced from the different recording angles, the breath-dependent movement of the markings arranged on the patient or in the vicinity of the radiation target being tracked by a navigation and tracking system with computer and camera guidance and referenced with the dynamic shifting of the target point directly or indirectly (e.g. via implanted markers) visible in the images, in order to take into account the breath-dependent shifting of the target point during irradiation as claimed in dependent claim 14.

Regarding claim 23, none of the prior art teaches or suggests a device for accurately positioning a patient relative to a linear accelerator for radiotherapy having a table that is shifted relative to the linear accelerator in opposite directions first to position the patient between the single image recorder and a first x-ray source for producing a first one of the x-ray images and then to position the patient between the single image recorder and a second x-ray source for producing a second one of the x-ray images as claimed in dependent claim 23.

Regarding claim 25, none of the prior art teaches or suggests a device for accurately positioning a patient relative to a linear accelerator for radiotherapy having a patient table which is controllably shiftable in a first direction for positioning at least a portion of the patient between an image recorder and a first x-ray source for producing a first one of the x-ray images and then in a second direction to position the patient between the image recorder and a second x-ray source for producing a second one of the x-ray images as claimed in independent claim 25.

### ***Response to Arguments***

Applicant's arguments with respect to claims 1-26 have been considered but are moot in view of the new ground(s) of rejection.

**Conclusion**


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hoon Song whose telephone number is (571) 272-2494. The examiner can normally be reached on 8:30 AM - 5 PM, Monday - Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Edward Glick can be reached on (571) 272 - 2490. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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